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EXAMINER

RUTHKOSKY, MARK

| ART UNIT | PAPER NUMBER |
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1745

DATE MAILED: 09/11/2002

20

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/232,498

Applicant(s)

MIZUNO, SEIJI

Examiner

Mark Ruthkosky

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1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-13 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) 4 and 9 is/are allowed.
- 6) ☐ Claim(s) 1,3,5-8 and 10-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

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DETAILED ACTION

Summary

1. Claims 1 and 3-13 are pending.

Claim Rejections - 35 U.S.C. § 112

2. The rejection of claims 1-3, 5-8 and 11-12 under 35 U.S.C. 112, second paragraph, has been overcome by the applicant's amendment.

Claim Rejections - 35 U.S.C. § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 13 is rejected under 35 U.S.C. 102(b) as being anticipated by Taylor (US 4,592,968.)

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The instant claim is to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator.

Taylor (US 4,592,968) teaches method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator (see example 1, col. 8, lines 5-25.) Thus, the claim is anticipated.

Claim Rejections - 35 U.S.C. § 103

5. Claims 1, 3, 5-8 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 59042781.

The instant claims are to a method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing the material.

Sandelli et al. (US 4,643,956) teaches a process for producing (col. 4 and examples) a separator plate for fuel cells which includes an electrode substrate and separator assembly where the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder (can be phenol resins, including novolacs, see claim 3, col. 3-4 and examples.) While this process teaches the binder can be a mixture of phenolic resins, it does not teach a process for mixing phenolic resins and epoxy resins to form a

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separator (col. 20, line 10). JP 59042781 (abstract), however, teaches a method for producing a carbon material for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing the material. The specific example shows a paravinylphenol polymer (phenol) and a novolak type phenol resin initial condensate having an epoxy group (epoxy) added to graphite powder. Novolac phenol resins are disclosed. The carbon is graphite less than 100 microns in size.

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in JP 59042781 as the binder of Sandelli et al. (US 4,643,956) as the materials are shown to bind the carbon into a sturdy, conductive plate for fuel cell applications. JP 59042781 teaches the plate with this binder has improved chemical resistance, heat resistance and gas impermeability which are features desirable for such a separator. The use of such carbonaceous plates as separators is well known in fuel cell assemblies.

As the epoxy resin is reacted with the phenolic resin, one of ordinary skill in the art would have the knowledge to choose to react the functional groups in about a 1:1 stoichiometry as the reaction will go to completion and form the desired product. It is also obvious to one of ordinary skill in the art to use cresol novolak and bisphenol A type epoxy resins as the epoxy resin binder in a fuel cell, and resol phenolic resins as the phenol resin binder in a fuel cell. These specific resins are commonly used in the art as binders (see Hasegawa US 4,369,238, claim 2; and Sugaya US 5,128,378, col. 4, lines 60+ as examples.) for polymeric separators in electrochemical devices.

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6. Claims 1, 3, 5-8 and 11-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 08-151,461.

Sandelli et al. (US 4,643,956) teaches a process for producing (col. 4 and examples) a separator plate for fuel cells which includes an electrode substrate and separator assembly where the process includes supplying materials into a mold comprising a carbon (carbon particles of 50 microns or less, see col. 3, lines 1-50), and a binder (can be phenol resins, including novolacs, see claim 3, col. 3-4 and examples.) While this process teaches the binder can be a mixture of phenolic resins, it does not teach a process for mixing phenolic resins and epoxy resins to form a separator (col. 20, line 10). JP 08-151,461 teaches a process for producing a plate for fuel cells where the process includes supplying materials into a mold, wherein the materials comprise carbon (carbon particles of 5-25 microns are shown in paragraph 12), and a binder of phenolic and epoxy resins, to form a plate (can be phenol resins, including novolacs, see p. 13-16.) The amount of epoxy relative to the phenolic resin is 5-50% which falls in the range of 1:1 (p. 33). Compression molding with heat is disclosed in p 29.

It would be obvious to one skilled in the art at the time the invention was made to use the molding composition presented in JP 08-151,461 as the binder of Sandelli et al. (US 4,643,956) as the materials are shown to bind carbon into a smooth, porous conductive plate for fuel cell applications. The JP 08-151,461 teaches the plate has improved smoothness and porosity using the method and binder described. One of ordinary skill in the art would have the knowledge to

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use of such carbonaceous plates as separators for in fuel cell assemblies as the plates will provide desirable characteristics known in the art for such fuel cell stacks.

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 08-151,461 and further in view of Taylor (US 4,592,968).

The teachings of Sandelli et al. (US 4,643,956) and JP 08-151,461 have been previously described. The references do not teach the grinding of the fuel cell plates in order to remove the surface layer that is in contact with the mold. Taylor (US 4,592,968), however, teaches method of manufacturing a separator for a fuel cell comprising the steps of mixing a carbon, and a resin, charging the material into a mold, heat pressing the material and grinding a surface of the separator (see example 1, col. 8, lines 5-25.) It would be obvious to one skilled in the art at the time the invention was made to grind the surface layer of the plate in order to remove impurities from the surfaces and provide a uniform thickness. One of ordinary skill in the art has the knowledge to grind the surface as taught by Taylor.

Allowable Subject Matter

8. Claims 4 and 9 are allowed.

9. The following is an examiner's statement of reasons for indicating allowable subject matter. The limitations in these dependent claims, including the use of glycidylamine as the epoxy resin, and the method step including particle sizes by spraying and drying, are not taught with the process steps of claim 1. Thus, these claims are allowed.

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Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

10. Applicant's arguments filed 9/6/2002 have been fully considered but they are not persuasive.

The Sandelli et al. (US 4,643,956) reference is used to show a process for producing an separator assembly for fuel cells where the process includes supplying materials into a mold comprising carbon particles and a binder. While this process teaches the binder can be phenol resins, it does not specifically teach a process for mixing epoxy resins and phenol resins to form a separator. JP 59042781 is used to support the method of Sandelli et al. (US 4,643,956) as it also teaches a method for producing a carbon material for a fuel cell comprising the steps of mixing a carbon powder, an epoxy resin and a phenolic resin, charging the material into a mold and heat pressing the material. The specific method uses a vinyl phenol and a condensate novolac type phenol resin initial condensate having an epoxy group.

The applicant argues that the JP 59042781 supporting reference is different than the instant claims as it teaches a combination of a phenol and a *phenol resin initial condensation product* which has an *epoxy group*. The premise is that the *phenol resin initial condensation*

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product which has an *epoxy group* is different than the epoxy resin of the instant claims. The instant claims make no specific limitations to the epoxy and therefore the phenol resin initial condensation product with an epoxy group is considered an epoxy. Further, as it is reacted with the vinylphenol, it is also considered a raw material for the reaction. The components are added together in the example.

These supporting reference includes the three components necessary in the mixture, carbon powder, an epoxy resin and a phenolic resin, and therefore, the reference does support the Sandelli et al. (US 4,643,956) reference for using the material as a fuel cell separator and include the limitations of the claims.

The new rejection under 35 U.S.C. 103(a) as being unpatentable over Sandelli et al. (US 4,643,956), in view of JP 08-151,461 shows a mixture of an epoxy resin and a phenolic resin in a range with a ratio of 1:1 of binders and that a plate with this binder forms a smooth, porous, surface.

Examiner Correspondence

11. Any inquiry regarding this communication or a previous communication should be directed to Examiner Mark Ruthkosky, whose telephone number is (703) 305-0587 or his supervisor, Patrick Ryan, whose phone number is (703) 308-2383. Please note that Examiner Ruthkosky is out of the office the first Friday of each bi-week period. The PTO official fax number is 703-872-9310, while the PTO after-final, fax number is 703-872-9311.

MARK RUTHKOSKY
PATENT EXAMINER
ART UNIT 1745
9/14/02